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ED L. AYERS

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This Month

Citrus Insect Control For December, 1953
Aids In The Detection Of Tristeza In Florida Citrus
Where Do We Go From Here?
Does Irrigation Pay In Your Grove?
Degreening Conditions For Florida Citrus
Some Low Temperatures And Related Damage To Citrus
Avocados And Limes — Fall 1953

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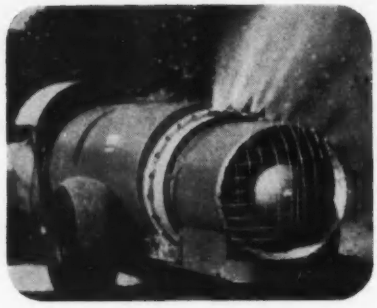

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R. M. Pratt

Citrus Insect Control For December, 1953

R. M. PRATT AND W. L. THOMPSON*
FLORIDA CITRUS EXPERIMENT STATION
LAKE ALFRED

W. L. Thompson

Rust mite activity has remained at a very high level all through November, and while there will probably be some reduction during December, many groves will be injured if control measures are not applied. Infestations are now substantially heavier on leaves than on fruit, and considerable greasy spot and leaf drop may result.

Purple mite activity has been stable during the past six weeks. While the general level of activity is not high, a number of groves are heavily infested, particularly in the Ridge and Brooksville Districts. The situation in December will depend on the amount of rainfall. Any extensive dry weather can be expected to be accompanied by generally high populations.

Purple scale activity is moderately high and fruit drop is occuring in some groves as a result of infestations around the stems. While a few locally heavy populations of red scale have been reported, the general level is low and this scale is not expected to be much of a problem during December.

Spray Programs

Purple scale being at a fairly high level, some groves may need treatment before the post-bloom sprays. Trees heavily infested with purple scale are very susceptible to cold injury. Even though freezing weather does not occur, a heavy leaf and fruit drop followed by an excess amount of dead wood is likely to develop, following a winter infestation of scale. Florida red scale will also cause leaf and fruit drop. If possible, have the crop picked before treatment is made, because a more thorough coverage can be accomplished on trees from which the crop has been removed.

Parathion is preferred during the winter months because it is not so much of a shock to the trees as an oil emulsion. A December oil application may weaken the tree to the extent that an excessive leaf drop may occur if freezing weather develops any time during the winter. An oil spray may also affect the trees in such a way that a normal amount of bloom will not develop next spring, and on Valencia and any late bloom fruit, degreening will be more difficult.

Purple mites are likely to be a factor in causing heavy leaf drop where they are not controlled. Inspect the summer and fall growth on the east, south, and west sides of the trees. Also start checking for six-spotted mites on lemon sprouts and around colonies of purple scale.

Rust mite infestations are still numerous and can cause the same type of leaf drop as purple mites. Even where the fruit has been picked, the mites should be controlled if the leaves and green twigs become heavily infested. Rust mites, like purple mites, are likely to be most numerous on the tops of the trees.

Scale Control: Where scale control is necessary, use 1 2/3 pounds of parathion per 100 gallons. Apply the spray while the air is calm and on days when the temperature is above 60 degrees. This maximum concentration is recommended because in the interior of central Florida, parathion is not as effective during the winter as it is in the summer. According to unpublished data of W. T. Long, there are indications that on the East Coast, winter applications are very effective.

Purple Mite Control: Mites will be the most important pest to control during the month of December. There are now three miticides that can be used and they are effective for killing both purple and six-spotted mites. DN Dry Mix is used at 2/3 of a pound per 100 gallons. The Aramite brands are used at 2 pounds per 100 gallons and the Ovotran brands are used at 1 pound per 100 gallons. All of these materials can be combined with wettable sulfur and parathion. Ovotran can be mixed with lime-sulfur but DN Dry Mix and Aramite should not be used in an alkaline solution. On small to medium sized trees, a 1½% DN-Sulfur dust is effective if a thorough application is made. For satisfactory control thorough coverage with either dust or spray is necessary on all foliage. Failure to obtain two to three months control during the winter is due mainly to lack of coverage, delaying the application until a heavy infestation has developed, rainfall within a week after the application, or reinfestation from adjacent groves.

Rust Mite Control: Any of the common forms of sulfur are effective but during cool weather a combination of 1 gallon of lime-sulfur plus 5 pounds of wettable sulfur is the most effective. If 5 pounds of wettable sulfur per 100 gallons or 25 pounds per 500 gallon tank is used it should be weighed or measured. Guessing at emptying one half of a 50 pound bag of sulfur is not a good practice because too often more than 25 pounds is poured from a full bag which leaves the next tank short of wettable sulfur. If lime-sulfur is not in the spray then 10 pounds of wettable sulfur per 100 gallons should be used, except in combination with parathion when 5 to 8 pounds is sufficient because of the more thorough application. Sulfur dust can also be used on small to medium sized trees but it is usually not as effective as a spray.

For further information refer to the 1953 "Better Fruit Program" or consult the Citrus Experiment Station at Lake Alfred or Fort Pierce.

United States farmers are now receiving about 45 cents of each dollar that consumers spend for food. U. S. Department of Agriculture economist figure that producers will receive about the same proportion of retail prices next year. Although returns from individual foods will vary widely, the economists now think that retail prices, prices received by farmers for food products, and charges for marketing foods will average about the same in 1954 as in 1953.

*Written November 25, 1953. Reports of surveys by Harold Holtsberg, Cocoa; J. B. Weeks, Avon Park; J. W. Davis, Tavares; K. G. Townsend, Tampa; and T. B. Hallam, Lake Alfred.

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Aids In The Detection Of Tristeza In Florida Citrus

THEODORE J. GRANT (1)
AT MEETING FLORIDA STATE HORTICULTURAL SOCIETY

In view of the fact that the causal agent of a virus disease can not be isolated and studied in culture media, as is the case with many bacterial and fungus diseases, it is necessary to employ other methods of study. The first general observations on tristeza, or quick decline, made under field conditions in South Africa lead to the knowledge that sweet orange tops on sour orange rootstocks showed decline symptoms while tops of the same sweet orange variety on some other rootstocks did not show disease symptoms. This then was the first method of recognizing the disease in the field. As a result of anatomical studies by Schneider et al. (9) in California of bark at the bud union of infected sweet orange on sour orange rootstock, there is not only a better understanding of the effects of tristeza, or quick decline, on the phloem tissues but there has developed an anatomical method of identifying this disease in the field.

The discoveries that tristeza, or quick decline could be transmitted by buds (10) and by the **Aphis citricidus** (Kirk), (1, 7) furnished evidence that the disease is caused by a virus. The knowledge of transmissibility of quick decline virus by means of buds led to the establishment of rootstock tests in California (2), where buds from diseased trees were used as sources of inoculum. The knowledge that tristeza virus could be transmitted by an aphid in Brazil was followed by extensive rootstock tests carried out cooperatively by the Instituto Agronomico of Sao Paulo and the United States Department of Agriculture (5) in which scion-rootstock combinations were inoculated by means of the aphid vector. This cooperative work resulted in classification of the rootstock as tolerant or non-tolerant to the tristeza virus. Inoculated seedlings of some 50 different citrus varieties were found to express disease symptoms. The cooperative investigations also led to the knowledge that there are strains of the tristeza virus and that some strains cause severe disease while others cause milder disease symptoms (6).

The inoculation of citrus seedlings in Brazil by means of viruliferous aphids led also to the finding of vein clearing symptoms on **Aeglopsis chevalieri** Swingle and on West Indian type limes such as Key and Beledy (**Citrus aurantifolia (Christm.) Swingle**) (4).

The combination of vein clearing and stem pitting symptoms on West Indian type limes such as the Key lime inoculated with tristeza, or quick decline, virus has been observed in tests carried out in South America (4), South Africa (3), and California (11). This combination of vein clearing and stem pitting of inoculated Key lime plants was the initial means of detection of a mild strain of the tristeza virus in Florida. Later a combination of Key lime plant inoculations, and the bark-sampling technique worked out by Schneider was employed by the Florida State Plant Board and cooperating organizations (3) to determine the distribution of the tristeza virus in this state.

In the latter part of August 1952, Dr. J. F. L. Childs of the U. S. Horticultural Station found, in Florida, some Persian, or Tahiti, limes with distinct vein clearing. Collection of branch material from these vein-cleared Persian plants and bottle-grafting to Key lime test plants showed that they were carrying the tristeza virus. This initial test for presence of the tristeza virus in vein-cleared Persian limes was repeated. When positive vein clearing and stem pitting were obtained on the inoculated Key lime plants, the State Plant Board officials were advised. They then gave the information to their grove inspectors, proceeded to look for these symptoms on Persian limes. It was thought that in this way futher information as to tristeza virus distribution might be obtained. Each grove inspector, upon finding what he thought to be

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vein-cleared Persian lime leaves, collected scionwood and forwarded it to the U. S. Horticultural Station at Orlando. The budwood thus received was bottle-grafted to Key lime test plants. In tests of 35 samples budwood of 7 samples failed to make positive unions; of the remaining 28 samples 14 from Persian limes transmitted the tristeza virus to Key lime plants.

The state Plant Board grove inspectors also found and collected samples of what they considered to be vein clearing and stem pitting on 8 limequat trees. However, only one of these proved to be carrying the tristeza virus. Likewise the inspectors collected budwood from a few lemon trees showing vein clearing symptoms and one of these, a Meyer lemon, proved to be carrying the the tristeza virus.

The proof that the tristeza virus was the cause of vein clearing would require that healthy Persian limes, limequats, and Meyer lemon be inoculated with a pure strain of the tristeza virus. The development of vein clearing on these inoculated plants would then be evidence that the tristeza virus alone was the cause. However, the fact that the virus was recovered from 14 of the 28 Persian limes constituted good evidence of a definite association.

On the other hand, the finding of only one limequat with positive tristeza virus out of 8 samples tested is considered very poor evidence of a definite association of tristeza virus and stem pitting on limequat. Likewise, the finding of one Meyer lemon with vein clearing that gave positive transmission of tristeza virus to Key lime is of considerable interest but is is inconclusive until samples from other similar trees can be tested and found infected.

Vein Dashes on Sour Oranges and Grapefruit

Study of the tristeza disease of Florida citrus is being carried out under controlled conditions in the greenhouse and screenhouses at Orlando. Healthy seedlings of several citrus varieties as well as Key limes have been inoculated. Three sources of tristeza virus have been used. The origin of two of the virus sources was a mandarin lime, and an Orlando tangelo. Scionwood from these field trees was bottle-grafted to Key lime plants, and the presence of tristeza virus was judged by the development of typical vein clearing and stem pitting symptoms. These infected Key lime plants were used as two of the sources of tristeza virus. The third source of inoculum was a potted Key lime seedling exposed for a ten day period to natural infections by placing it under a known infected tree in the field. This seedling lime was naturally infected, presumably by an insect vector, and was therefore considered to be free of psorosis-type viruses, which are not known to be insect-transmitted.

Tristeza virus from all three of these sources produced vein clearing and stem pitting on Key limes. The insect-inoculated virus source produced the mildest symptoms. When sour orange seedlings were inoculated by means of scionwood bottle grafts, it was noted that in some cases the young top leaves of the sour orange became yellow but that subsequently new normal growth appeared. All inoculated sour orange plants were somewhat stunted, but they continued to live and produce new growth. Transfers by bottle grafts to Key lime showed that the tristeza virus had lived and multiplied in the sour orange without killing the plants. Careful examination of the new young sour orange leaves revealed the presence of occasional tiny vein-cleared dashes in the lateral veins. This symptom has been called vein dashes as distinct from the more conspicious and general vein clearing characteristic of tristeza-virus-infected Key lime. Similar vein dashes were noted on young leaves of Duncan grapefruit seedlings inoculated with scionwood from the same three sources of tristeza virus.

These vein dashes tended to disappear as the sour orange and grapefruit leaves matured. Although this symptom was transitory and could be found only by careful examination of the young leaves in strong sunlight, it was considered important to determine whether it could be used under field conditions to identify tristeza-infected trees. Two State Plant Board inspectors, A. C. Crews and H. M. Van Pelt, were shown the diagnostic vein dashes and asked if they would bring in from the field material that showed this symptom. Within a short time these men brought in four samples of grapefruit and one sample of sour orange. Bottle-grafts of branches from these samples to Key lime test plants all showed that the tristeza virus was present in the samples collected.

The value and practical importance of this work have yet to be demonstrated, but it does open up the possibility of detection of tristeza in grapefruit trees by inspection of young foliage. The application of this knowledge may be especially helpful in determining distribution of tristeza in the Florida Ridge section, where grapefruit is grown on Rough lemon rootstock and where the bark-sampling identification technique is not yet applicable.

Discussion of Practical Applications

The citrus grower may question the practical value of information concerning vein clearing on limes and vein dashes on grapefruit. However, as a means of detecting presence and distribution of tristeza virus in his grove they may give the trained State Plant Board inspector and the scientist, additional methods of determining the presence of the disease. Increase in our knowledge of this disease has been arrived at slowly, but each step has led to greater accuracy and to reduction in the number of plants that have to be tested in detail in order to be sure that the tristeza virus is present.

In the survey (3) for presence and distribution of tristeza in Florida many tests of virus transmission have been made from diseased field trees to Key lime plants. Results indicate that in many instances not only tristeza virus but also psorosis and other virus-like disease agents were present in the scionwood from the declining field trees. This information, combined with field observations of declining sweet orange on tristeza-tolerant rootstocks such as Rough lemon with no evidence of recognized cause, indicates that other virus or virus-like diseases in Florida present a complex picture. The obtaining of a detailed understanding of these diseases and the action or interaction of their causal agents will require appreciable time and study. In the meantime the grove owner wants to know what can be done. The answer at this time must of necessity be based on the knowledge of general behavior of virus diseases and on precautionary measures of sanitation.

In plant disease as in human disease outbreaks one of the first steps to be taken is that of practical common-sense sanitation. If the source of a human disease infection is the water or milk supply these should be cleaned up. In the case of virus diseases of citrus, budwood can be a definite carrier of the infectious agents. The grower's active cooperation in the State Plant Board's bud-certification program is an important first step toward freedom from virus diseases. This program for a supply of healthy budwood can not be accomplished overnight. As knowledge increases, the methods of detecting the virus diseases can be improved so that eventually the State Plant Board may be testing for more viruses than are now recognized and thus may be able to eliminate them or reduce their occurrence in budwood supplies. In the future it may also

(Continued on page 13)

Where Do We Go From Here?

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WINTER HAVEN

During the past two years I have had an opportunity to observe citrus insect control from an angle entirely new to me. These observations have placed me in a position where some soul-searching has been in order. I want to discuss these observations, point out some pertinent facts, and attempt in a small way at least to direct our thinking along slightly different lines than many of us have pursued in the past. While my remarks will be confined to citrus, I believe that citrus may well serve as an example for some crops grown under other circumstances.

Today, the citrus industry is in the position of having one or more chemicals available for the control of all our citrus insects and mites. The power sprayers which are available are capable of giving thorough and adequate coverage. Savings are being affected by the use of concentrated sprays. I wish to begin my discussion by raising two questions. What is the most economical way to control citrus pests? Is it possible that when applying sulfur we spray too thoroughly and use too much material?

One point should always be foremost. Insect or mite control must be judged not by the cost per box but in the final analysis by the growers net profits. The cost of an individual application is not the important one, but rather the cost of the program for the year as compared with the results obtained.

Spray vs. No Spray

There are five major topics which I wish to discuss. The first one is concerned with the type of results obtained from complete spray programs when compared with no sprays or dusts at all. Accurate comparisons are difficult, if not impossible, to obtain in commercial operations. The grower who reduces his spray program usually reduces his fertilizer program, and thus results are not comparable. Since about 1940 there have been two unsprayed plots of grapefruit at the Citrus Experiment Station. Up to two years ago these trees had produced at least ½ box per tree per year more than the supposedly properly sprayed trees about them. When this became known to me in 1947, I set up two experiments to determine if this phenomenon was real. The first four years of these experiments were reported by Griffiths and Thompson (4). Unfortunately, the trees were not uniform in one experiment and the smallest trees in the grove made up the untreated plots. Here actual yields were less, but trends were identical. That is, sprayed and unsprayed tree yields increased or decreased in approximately the same proportion each year. In the second experiment, trees were uniform and yields from the unsprayed plots were just as good or better than from the completely sprayed ones.

Similar experiments on oranges have run fewer years and are not as conclusive, but the trends on yields are similar.

There has been a definite difference in tree condition between the two sets of plots. The unsprayed trees have usually defoliated in the winter as the result of greasy spot. In spite of this, evidence that total yields were affected is not present. However, it is probably that the defoliation resulted in more late bloom fruit.

So far as insects were concerned, scales were never a major problem in the unsprayed plots, and there were actually fewer purple and red scales on the unsprayed fruit at picking time than on fruit where sprays had been applied.

Purple mites were no problem where they were not controlled but six spotted mites caused injury in some years.

Internal quality was not reduced by eliminating all sprays and dusts. In fact, solids were usually better from the unsprayed plots.

I do not mean to stand here today and suggest that the elimination of all sprays and dusts is either desirable or practical, although this may be the case. I do believe that the results obtained in these plots cast some doubt upon the hypothesis that the use of sprays and dusts necessarily increase yields on citrus in Florida.

Spray Residues

Much has been said and written concerning the effects of spray and dust residues on citrus. In collaboration with Fisher and Thompson, (1,2,7), I have had opportunity to study several aspects of this problem. Results of these experiments and general observations have led me to these conclusions. Pound for and general observations have led pound of residue, copper and zinc result in greater insect and mite increases than sulfur. **In actual grove practice the frequency of sulfur application causes greater increases of both scales and purple mites. There can be little doubt that the regular and intensive use of sulfur is a major factor in the increased insect and mite problems following these applications.**

It is probable that every time a spray or dust is applied some undesirable results are obtained, because of a reduction in the effectiveness of the biological checks on pest populations. From the standpoint of biological control it appears to be desirable to work toward reduced spray programs. The elimination of zinc and copper by many

* Presidential address delivered before the annual meeting of the Florida Entomological Society on September 10, 1953, at Miami, Florida. Reprinted from The Florida Entomologist.

growers has produced very little effect upon the necessity for insect and mite control. This emphasizes the fact that sulfur is often a major cause of later excessive insect and mite infestations. This raises a question which needs considerable study before an adequate answer is found. **How much sulfur is necessary?**

Dusting vs. Spraying

In 1952, Griffiths, Stearns, and Thompson (3), summarized three years results when dusts were compared with sprays for the application of sulfur. In this work, relatively idea dusting conditions were attained. Although the trees involved would usually have been thought of as 15 gallon trees, only 10 gallons, or 1 pound of sulfur per tree, was applied in most instances. Minimal amounts were used in an effort to demonstrate differences in the methods of application. Although there was no practical difference, in terms of fruit grade, between the two methods of application, more scales were present on fruit from the sprayed plots.

Another factor which was discussed very little in the original paper dealt with differences in speed of the machines at the time of application. Although comparisons of speed were made in at least six instances, differences in rust mite control could not be demonstrated.

I believe we will all agree that dusting is less thorough and is more apt to result in failure. In spite of this, there are many groves in the state that are dusted only two or three times a year and rarely, if ever, have a scalicide applied. These groves usually escape with little or no rust mite injury.

Similarly, if one goes into some of the old citrus producing areas of the state, it may be readily noted that the growers use low gallonage per tree, spray less often, and use boom type sprayers at relatively rapid speeds. In spite of this, these growers produce excellent quality fruit that is most acceptable in fresh fruit channels. These facts suggest that it may be possible and desirable to minimize the use of sulfur in all groves on the basis of insect and mite control.

Greasy Spot and Defoliation

During the past two winters, groves particularly in the Ridge Section, have suffered very severe defoliation. While purple mites may have been a factor in some instances, the primary cause associated with the defoliation was greasy spot (6). I fully realize that many growers and some production men still insist that rust mites are not the cause of this condition. In my own experience I have yet to find greasy spot a problem in any grove when rust mites were never allowed to reach infestations higher than 51-25% of the fruit infested. Other insects or mites can cause greasy spot and it is always possible that some mite, associated with rust mites, and also controlled by sulfur is the real culprit. This theory is certainly open to question.

I wholeheartedly agree that there is more to greasy spot than just rust mite feeding. Tanaka and Yamada, Japanese workers, described a similar condition and claimed that it was caused by a fungus which entered at the site of the stomata (5). Miss Fran Fisher has been working along this line in Florida. I have seen numerous instances where a great many rust mites produced little or no injury to fruit or greasy spot on foliage. Similarly, there are many cases where injury is severe, and only a relatively few mites were present. I will venture an opinion here, that before all is said and done, it will be shown that greasy spot and fruit injury are only indirectly caused by rust mite feeding and that the real cause is a secondary invader such as fungus, bacterium, or the like. Further, I strongly suspect that the stomata are more closely associated with late rust mite injury to fruit than are the oil cells.

In any case, greasy spot defoliation as it has appeared in the field is often associated with small leaves in the tops of the tree and a failure of the tree to produce satisfactory growth in the top. One school of thought has held that this is simply a failure to get good coverage with sprays. At the present time I cannot agree with this.

I could name several caretakers who are notorious for poor spray jobs, but who have had few greasy spot troubles. On the other hand, some of the worst affected groves have been on good spray programs and coverage has been as good as can be obtained with present day equipment.

In this connection I would like to cite another example. Last winter in a grapefruit grove where trees were being cut off for top working I made the following observations. These trees had not been sprayed or dusted with sulfur since the preceding

(Continued on page 18)

Does Irrigation Pay On Your Grove?

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FLORIDA AGRI. EXPERIMENT STATION

Available evidence from grove records accumulated over 21 seasons by the Agricultural Extension Service and Agricultural Experiment Stations does not indicate that it paid to irrigate the average grove of these records in the manner irrigation was done over this period. There were, however, individual groves that responded sufficiently to irrigation for it to pay. At the same time, there were groves of this group that would have made more money and the trees remained in good condition had irrigation as practiced been omitted.

Each grower who irrigates should make a check in one or more groves to determine whether or not irrigation is paying on his groves. One good way to do this is to designate two or more middles that will never be irrigated. Care should be taken to see that the same middles receive no irrigation water at any time. Such middles should be well within the grove and representative of the general grove area and varieties in the grove. The yield from the rows of trees inside the area should be compared with the irrigated portion of the grove, keeping in mind irrigation cost.

From grove records obtained there appear to be no appreciable accumulative benefits from irrigation as it has been practiced. That being true, the measure of benefits is yield differences. In bearing groves 11 years of age or older, if the yield is not increased sufficiently by irrigation to more than pay irrigation costs, it would not pay to practice irrigation as a general rule.

The accompanying table indicates the approximate number of boxes of different kinds of citrus necessary to pay the cost of applying two inches of water per irrigation per acre during the specified season or seasons. Application charges at the present time of several caretaking organizations were averaged to obtain the figure of $15.25 cost for applying two inches of water per acre. Such charges vary for these organizations with different groves according to distance from source of water, distance of grove from caretaking plant, and other variables. Growers owning their own equipment vary as to these costs. The average of $15.25 per acre appears to be representative enough for its use in these calculations. Growers having irrigation costs widely different from this figure should make their own calculations in this regard.

Ordinarily a grove may not be irrigated more than twice during a season. The distribution of rainfall is such in some seasons to make irrigation unnecesssary. However, during some seasons some groves are irrigated several times. The accompanying table includes data for four irrigations. When fruit prices are high comparatively few boxes are necessary to pay for each irrigation. Fruit prices and yield increases should be anticipated before irrigating in order to arrive at the number of irrigations that might be applied without too great a loss on irrigation operations.

Temple oranges usually bring the highest on-tree price and, consequently, fewer boxes are necessary to pay for an irrigation. In 1951-52 the season on-tree price of seeded grapefruit was 30 cents per box and 51 boxes were required to pay for an irrigation cost of $15.25 per acre. Only 10 boxes of Temples were required for that amount in the same season.

For irrigation to pay during the periods indicated in the accompanying table, or for future periods when on-tree prices are the same, yields must be increased in excess of the amount indicated for irrigation to be profitable. If you irrigate your grove, check to determine whether or not your irrigating is profitable.

APPROXIMATE NUMBER OF BOXES OF FRUIT NECESSARY AT SEASON ON-TREE PRICE TO PAY APPLICATION COST AT $15.25 PER ACRE FOR TWO INCHES OF WATER PER IRRIGATION

	One Season 1952-5 *				One Season 1951-52				Average 5 Seasons 1947-52				Average 5 Seasons 1942-47			
Number of irrigations	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Oranges: Early	14	27	41	54	20	40	60	80	13	26	39	52	9	18	26	35
Midseason	15	30	44	59	27	54	81	108	14	28	42	56	11	21	31	41
Late	12	23	34	45	18	35	52	70	11	22	33	43	8	16	23	31
Mixed	13	25	37	50	21	41	61	81	12	24	36	47	9	17	25	33
Temple	8	16	24	32	10	19	28	37	8	15	23	30	7	14	20	27
Tangerines	11	21	31	41	12	24	36	48	17	33	49	65	10	19	29	38
Grapefruit: Seeded	25	50	75	100	51	102	153	204	23	45	67	89	14	27	41	54
Seedless	17	34	51	68	21	42	62	83	16	31	47	62	13	25	38	50
Mixed	21	41	61	81	29	58	87	116	19	37	55	73	14	27	40	53
Mixed Citrus (1/3 grapefruit)	15	28	42	56	22	43	64	85	15	29	43	57	10	20	29	39

* Preliminary

LITTLE INTERNATIONAL LIVESTOCK SHOW TO BE HELD ON DECEMBER 12

The 1953 Little International Livestock Show will be held at the University of Florida, Gainesville, on Saturday, December 12 according to Ralph Wilhelm, Sarasota, president of the Block and Bridle club of the College of Agriculture.

Fourty pledges of the Block and Bridle will show cattle, sheep, and swine they have selected from the College herd, groomed, and trained for the event. A group of high school girls will take part in the pig-catching and cow-milking contests.

W. E. Newhall

Degreening Conditions For Florida Citrus

W. Grierson

W. GRIERSON AND W. F. NEWHALL
FLORIDA CITRUS EXPERIMENT STATION, LAKE ALFRED

AT MEETING FLORIDA STATE HORTICULTURAL SOCIETY

Ethylene degreening of Florida citrus is commonly carried out at 85°F., which is the maximum temperature allowed by State regulations when heat is applied in the degreening process (2). This temperature is considerably higher than is used in most other citrus growing countries, or even in other parts of the U. S. A.(6).

Approximately eleven years ago (in the season of 1941-42) C. K. Clark at the Citrus Experiment Station, Lake Alfred, initiated an investigation into the optimum degreening conditions for Florida grown citrus fruits (3, 4). The preliminary experiments were conducted with Hamlin oranges and, to a lesser extent, with Duncan grapefruit. Temperatures used ranged from 80° to 100°F. The degreened fruit was graded visually into three grades. Grade I showed no green at all. Grade II was commercial No. 2 as far as color was concerned and showed some green cast. Grade III contained all fruit too green to fall in the other classes. The degree of "color break" was expressed by a color index calculated by means of the relation:

Color Index = % No. 1+½ (% No. 1)

These results were presented in tabular form (4) and from them Clark concluded: "It is evident . . . that an optimum temperature exists, at which coloring proceeds at a maximum rate and that this temperature lies in the neighborhood of 85°F. . . . In addition it was noticed that fruit colored above 90°F. did not reach a final normal color but acquired a grayish cast."

Clark also tested the effect of humidity on the rate of coloring, using relative humidities from 60 percent to almost 100 percent. He found no relationship between humidity and rate of color change and concluded that regulation of humidity was necessary only to control shrinkage. This conclusion is in striking contrast to the views of Baier and Ramsey (1) who state that lowering of relative humidity drastically slows up the rate of degreening.

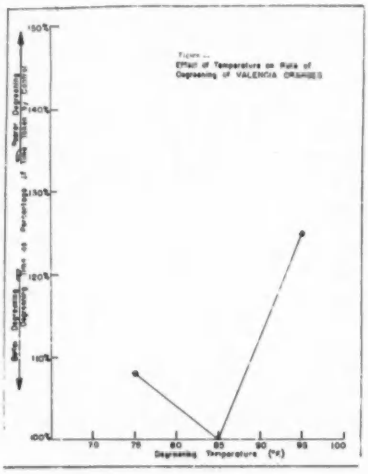

Fig. 2. Effect of Temperature on Rate of Degreening of Valencia Oranges.

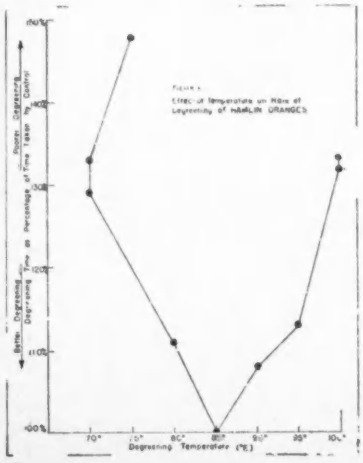

Fig. 1. Effect of Temperature on Rate of Degreening of Hamlin Oranges.

1952-53 Experiments

Experimental Methods.—Four small degreening cabinets of 50 cu. ft. internal capacity equipped with thermostatically controlled electrical heating elements were used in these studies. When it was necessary to use lower-than-ambient temperatures pails of ice were placed in the cabinets. This proved effective although laborious. Humidity was raised when necessary by wetting the interior of the cabinets and using lengths of partially immersed cheesecloth as evaporating surfaces. The relative humidity was reduced by means of trays of calcium choride. Ethylene was supplied by individual "trickle" units as used in commercial degreening rooms. Small fans with ducts and adjustable vents provided for internal circulation and/or ventilation.

The initial temperature range employed was 70°F. to 100°F. This was subsequently narrowed as the experiment proceeded. The samples were removed periodically and their averaged color recorded. This "average color" was read by comparing the light reflected from the surface of the whole sample with selected Nunsell colors (5), by a method similar to that described by Baier and Ramsey (1). A sample was considered to be degreened when it reached an arbitrarily selected point on the color scale corresponding to Nunsell code number "gy 8/10" for oranges and "yGY 8/8" for grapefruit. The efficacy of a treatment was measured in terms of "time to degreen".

With only four cabinets available, it was apparent that the experiment would extend over a considerable portion of the growing season and during this period the time necessary for degreening would change. For this reason one control sample was always degreened at 85°F. and medium (80 to 90% R. H.) humidity. This made it possible for all results to be expressed as a percentage of the time

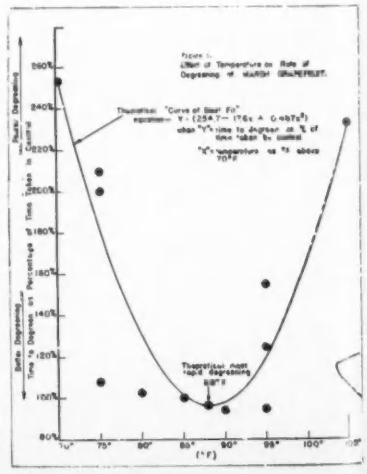

Fig. 3. Effect of Temperature on Rate of Degreening of Marsh Grapefruit.

required for the control.

Eight experiments were carried out in all, five with Hamlin oranges, three with Marsh grapefruit and one with Valencia oranges. The number of replicates in each experiment was always at least two and so many as five when sufficient green fruit was available. Each replicate included at least 20 and sometimes as many as fifty fruits.

The trials on Hamlin oranges started approximately three weeks prior to the commercial picking period into

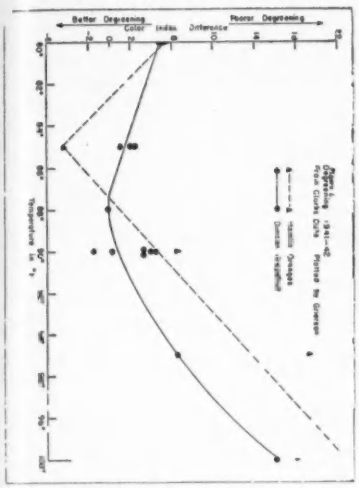

Fig. 4. Degreening 1941-42 from Clarke Data, Plotted by Grierson.

the regular harvests. The Valencias and grapefruit experiments were conducted in the course of the normal harvesting season.

Results

With Hamlin oranges the result indicated very definitely that 85°F. was optimum with regard to rapidity of degreening (see Figure 1). Above or below 85°F. the time to degreen was sharply increased.

No ethylene burn was encountered with mature fruit. However, considerable ethylene burn was encountered in the Hamlin oranges degreened prior to commercial maturity. The amount of this ethylene burn (numerous dark sunken spots) was directly related to degreening temperature. When immature oranges were degreened, only 2 percent of those at 85°F. were affected with ethylene burn, whereas 50 percent of those degreened at 100°F. suffered from ethylene burn. At 70°F. no ethylene burn was encountered even with immature fruit. With fully mature oranges no ethylene burn was encountered at any temperature.

The experiments with Hamlins included trials at a constant temperature and high, medium and low humidities. This was repeated at temperatures of 70, 85, and 100°F. Humidities employed ranged from 60% to 95% R. H. No relationship at all was discernible between humidity and rate of degreening. Even fruit that was so badly dessicated as to be unmarketable degreened fully as rapid as that degreened under medium or high humidity. This confirms the observations of Clark who failed to find any correlation between humidity and rapidity of degreening.

The single experiment with Valencia oranges again indicated that (of the temperatures tried) 85°F. gave the most rapid degreening (see Figure 2). In this experiment records of losses from stem-end rot and blue mold were kept during subsequent holding at 70°F. for a period of three weeks. Total losses at three weeks were 32%, 28% and 37% for fruit degreened at 75, 85 and 95°F. respectively.

The results with Marsh grapefruit were much less consistent than those with oranges. However, the existance of an optimum temperature, above or below which degreening is slowed up, is still apparent. But the optimum temperature range is much wider and there is less consistency within any given temperature range than was found with oranges. For this reason, a mathematically calculated "curve of best fit" as shown in Figure 3 was constructed instead of a line joining the actual datum points and it indicates that the most rapid degreening is to be expected at about 88°F. This is of particular interest when these results are compared with those of Clark. Figure 4 shows data from the tables of Clark's report (4) plotted in a manner comparable with the data in Figures 1, 2, and 3. It will be noted that, these early studies also indicated a narrow optimum range for oranges, centered at 85°F. and a wide optimum range for grapefruit, centered approximately on 88°F. The grayish color that Clark reported finding with fruit degreened at temperatures above 90°F. was not observed in 1952-53. Shrivelling was, however, more pronounced at temperatures above 90°F. After one degreening trial, using temperatures ranging from 70°F. to 100°F., samples of grapefruit were juiced and the freshly extracted juice submitted to a taste panel. No consistent differences in the flavor were noted.

The grapefruit used in those experiments were afterwards held at 70°F. and the losses from stem-end rot and other fungi noted at periodic intervals. Figure 5 shows the relationship between degreening temperatures and the amounts of fungal loss after three weeks subsequent storage at 70°F. Because susceptibility to fungi varied with picking dates all results are expressed as a percentage of the values for control samples degreened at 85°F. Most of the fungal loss encountered was stem-end rot, loss from which ran as high as 59%. Loss from other causes (principally **Penicillium**) never exceeded 4.3%. The tendency for subsequent fungal losses to increase across the range of degreening temperatures from 75°F. to 95°F. appears to be quite consistent. In view of this it is felt that, at present, no recommendation can be made that the maximum degreening temperature for grapefruit

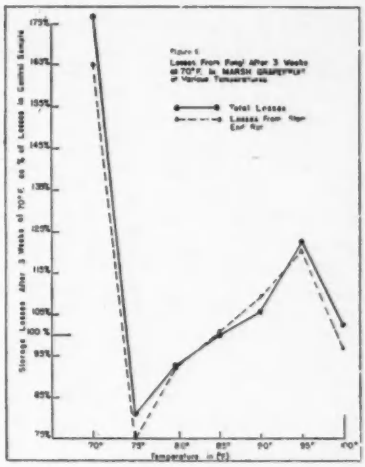

Fig. 5. Losses from Fungi After 3 Weeks at 70°F. in Marsh Grapefruit at Various Temperatures.

should be raised above the present limit of 85°F.

Summary

1. Hamlin and Valencia oranges were found to degreen most rapidly at a temperature of 85°F. Minor variations above or below this caused appreciable slowing up of the degreening process.
2. Optimum degreening temperture for grapefruit was found to be much less sharply defined.
3. When considering rapidity of degreening alone there is evidence that the optimum temperature for degreening grapefruit may be as high as 88°F.
4. There is evidence that any increase in degreening temperature above 85°F. may cause increased fungal rots in grapefruit and excessive shrinkage. Further research is necessary on these points.
5. No correlation was found between humidity and rate of degreening of oranges.

Literature Cited

1. Baier, W. E., H. J. Ramsey, et al, "Coloring Citrus Fruits", Bulletin, California Fruit Grow-

(Continued On Page 15)

Some Low Temperatures And Related Damage To Citrus

In The Upper East Coast District

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FEDERAL-STATE
FROST WARNING SERVICE,
LAKELAND

CITRUS

The following data are given as a preliminary attempt toward arriving at a definite conclusion as to how much cold weather citrus trees and fruit can withstand before being damaged. Because of knowledge gained by many temperature recordings and observations, it can be stated definitely that unless the minimum temperature is lower than 28° and below that figure for several hours, no damage will result. It is the opinion of the writer that the temperature on the first cold night must be as low as 26° to damage tangerines, 23° to 25° to freeze oranges, and lower than 23° to damage grapefruit. Additional data must be obtained before the latter premise can be stated with surety, but it may be noted that temperatures as low as 21° to 23° caused no damage to grapefruit. Temperatures immediately preceding a freeze must be con-

(Continued On Next Page)

STATION 1

(Valencia and Pineapple Oranges and Tangerines)

Date	Min. Temp.	Duration in hours and minutes at and below: 32°	31°	30°	29°	28°	27°	26°	25°	24°
11-25-50	26.5	4:00	3:50	3:40						
11-26-50	21.0	12:00 at 23°	11:45 2:30;	9:45 22°—	9:00 2:00;	7:0[illegible] 21°—	6:15 0:30	5:15	4:30	[illegible]:30
11-27-50	[illegible]2.0	1:00								
11-28-50	30.0	1:10	1:0[illegible]	0:50						
11-29-50	27.3	8:00	7:55	7:00	6:00	2:20	0:45			
11-30-50	24.2	11:30	10:40	10:00	9:00	8:00	7:00	5:15	2:45	[illegible]:00

When inspected on December 6th, oranges and tangerines near thermometers contained hesperidin specks, indicating that ice had formed in the fruit. No damage to foliage or trees.

Strong winds prevailed on the 25th, and light winds on the 26th. Heavy frost was noted on the 29th and 30th.

12-19-50	26.0	12:00	11:50	11:10	10:15	9:50	2:40	1:15	
12-20-50	25.	1[illegible]:00	12:30	12:00	11:00	10:00	7:15	3:15	2:00
12-21-50	[illegible]0.0	3:00	2:15	0:30					

Upon inspection about 7 A. M. December 19th and 20th, tangerines were found frozen hard and some slush ice was noted in oranges. No foliage damage. Heavy frost formed on all three nights.

1- 9-51	23.5	7:00	6:50	5:20	4:30	4:00	3:45	3:00	2:20	1:00

Valencia oranges on low outside limbs later showed some white specks, and were slightly dry at stem end. All were later harvested for fresh fruit market. Midseason oranges had been harvested previously. All tangerines dried up and were unfit for use. Trees showed no damage. Frost deposit light on 9th.

12-12-52	26.5	5:30	5:00	4:30	4:00	2:40	1:00		
12-15-52	32.0	0:30							
12-16-52	26.5	1[illegible]:00	9:15	8:00	7:00	5:00	3:00		
12-17-52	26.0	8:45	8:00	6:00	4:45	3:45	3:00	0:45	
12-18-52	28.0	7:00	5:30	4:45	3:20	0:30			
12-19-52	29.8	5:40	3:00	1:00					

Frequent checks until March 23rd showed no damage to fruit or trees. Some tangerines still on trees in mid-February were in good condition.

STATION 2

(Navels and Valencia Oranges)

11-25-50	26.0	5:15	5:00	4:00	3:30	2:15	1:15	0:45	
11-26-50	24.0	14:00	12:50	12:15	11:15	11:00	9:50	7:10	3:45	1:30
11-28-50	30.0	2:10	1:00	0:40					
11-29-50	27.5	9:00	8:[illegible]0	5:30	1:50	1:15			
11-30-50	27.7	10:00	7:15	5:30	4:00	3:00			

Upon inspection on December 2d, Navels near shelter showed signs that quite a bit of ice had formed in fruit. Trees on low ground west of thermometers were badly defoliated but wood damage was confined to young limbs.

12-19-50	26.4	8:50	7:30	7:00	6:30	6:[illegible]0	4:00	1:00
12-20-50	25.5	12:15	12:00	10:00	8:45	7:50	3:15	2:15
1- 9-51	26.0	7:15	7:00	6:15	4:15	3:30	2:00	1:15

Valencias near shelter showed very little or no damage but tangerines and Navels were a total loss.

STATION 3

(Valencia Oranges)

11-25-50	26.0	5:45	5:10	4:30	4:00	3:10	2:15	1:15
11-26-50	25.5	13:10	12:10	11:00	9:30	8:0[illegible]	4:20	2:30
11-29-50	30.0	7:30	4:00	1:15				
11-30-50	28.0	6:10	5:[illegible]0	4:15	3:10	2:00		
12-19-50	28.0	11:40	10:40	9:30	5:15	2:30		
12-20-50	28.0	10:00	9:45	9:10	6:3[illegible]	1:00		
1- 9-51	27.0	7:20	6:20	5:45	5:00	4:00	0:20	
1-27-51	28.0	8:50	8:30	6:45	2:30	0:30		

No freeze damage to fruit or trees in this grove.

(Continued On Next Page)

Department To Promote Expansion Of Fruit Exports

Secretary of Agriculture Ezra Taft Benson has announced the formulation with the Nation's fruit industry of a program to regain and develop export markets for perennial fruits and fruit products.

The program will emphasize both surplus removal and the development of continuous long-range markets. It is an evolvement of recent conferences between representatives of national fruit industry associations and officials of this Department and other Government agencies. Leadership in the program will be given by the Department's newly-created Foreign Agricultural Service. Fruits and fruit products in the program include apples, pears, oranges, lemons, grapefruit, plums, grapes, and the dried fruits.

"These fruits and products represent an annual agricultural income to the United States of more than $1 billion," the Secretary pointed out. "Prior to World War II the exports of perennial fruits and produce ranked first in United States exports of foods and third in all agricultural exports, exceeded only by cotton and tobacco. Since then, however, their export has been encountering difficulties resembling those faced by the 'basic crops,' such as cotton and tobacco and wheat."

"The fruit industry is a vital part of our American agricultural economy. It is essential that we do everything in our ability to aid this important industry in regaining and expanding the opportunities to market its products."

STATION 4
(Hamlin Oranges)

11-25-50	29.0	3:15	2:15	2:00	0:30					
11-26-50	24.0	11:00	9:30	9:00	8:10	5:30	4:30	2:15	1:00	0:30
11-27-50	32.2	0:30								
11-28-50	30.5	3:20	2:15							
11-29-50	30.0	5:15	4:30	3:00						
11-30-50	29.0	9:30	8:15	6:40	3:45					

When checked on December 1st and later dates, there was no evidence of freeze damage to fruit or trees.

1-26-51	29.0	3:00	2:30	0:45	0:20			
1-27-51	26.0	12:00	11:50	11:10	10:10	9:00	7:00	4:00

Fruit had been picked before 26th. No tree damage.

STATION 5
(Grapefruit, Tangerines, Midseason Oranges)

11-25-50	28.5	3:30	2:50	2:00	1:30				
11-26-50	25.0	10:30	10:00	8:00	5:50	5:10	2:15	0:50	0:30
11-28-50	31.0	3:00	2:30						
11-29-50	29.0	7:00	6:30	3:40	2:45				
11-30-50	26.4	9:30	8:50	8:00	6:40	5:00	3:30	1:30	
12-19-50	27.0	12:00	11:10	10:45	9:30	4:45	0:40		
12-20-50	26.0	13:00	12:15	11:30	9:30	7:15	5:00	2:00	
12-21-50	30.0	3:50	2:00	1:00					
1- 9-51	25.1	7:00	6:45	6:20	5:30	2:45	1:15	1:00	0:40

No fruit or tree damage. On March 5th, unpicked tangerines were in good condition.

STATION 5
(Seedling Oranges and Tangerines)

12-13-52	29.5	5:00	3:40	2:10				
12-15-52	30.0	2:20	1:10	0:50				
12-16-52	25.5	12:00	11:00	9:30	8:40	7:00	6:00	4:50
12-17-52	29.0	8:00	7:00	6:00	2:30			
12-18-52	30.0	7:45	3:00	2:00				
12-19-52	32.0	2:00						

No damage to fruit or trees.

STATION 6
(Valencia Oranges)

12-12-52	28.0	6:00	3:45	2:00	1:30	0:50			
12-15-52	29.5	2:10	0:50	0:20					
12-16-52	26.2	9:40	8:30	7:45	7:00	3:45	0:40	0:20	
12-17-52	26.0	11:15	10:10	9:00	8:00	5:30	3:00	1:30	
12-18-52	27.5	7:00	6:00	4:15	3:15	2:15			
12-19-52	29.6	6:00	4:45	2:30					

Frost was heavy on December 12, 17, 18; moderate 16, 19; light 15.
Frequent checks until March 21st revealed no signs of damage to fruit or trees during the season.

SOME LOW TEMPERATURES AND RELATED DAMAGE TO CITRUS IN THE UPPER EAST COAST DISTRICT

(Continued From Preceeding Page)

sidered when an attempt is made to determine whether or not ice will form in fruit. Ice will form with shorter durations of low temperatures on the second or third cold night than on a night following a warm day.

Occasionally, very little or no permanent damage will result from the formation of ice in fruit. Continued cool weather, with a slow thawing process, will lessen or eliminate damage from all but the more severe freezes. Fruit that has not matured will recover from a freeze more readily than will mature citrus. This is borne out in the following data where Valencia oranges staged complete or nearly complete recovery after showing signs of ice formation in November, December and January.

Critical temperatures for citrus foliage and wood is difficult to determine and varies with circumstances, but it is safe to state that foliage and wood willl withstand lower temperatures than will fruit. This may not hold true on a cold night with high winds or when the trees are not dormant.

AIDS IN THE DETECTION OF TRISTEZA IN FLORIDA CITRUS

(Continued From Page 6)

be advantageous to establish certified sources of seed as well as of budwood. The advantage of certified seed sources would be to insure, for example, that the particular Rough lemon is one known to have the desirable horticultural characters and tolerance or resistant to disease.

A sanitation measure that also can be taken is that of removing declining citrus trees from the groves. When a grove owner has citrus trees in a state of decline that do not respond to fertilizer or spray treatments it would be well to get rid of them. This is especially true where these trees are observed to occur singly or in scattered small groups. The fact that these trees are scattered might well indicate that some infectious agent is being spread. Certainly these trees are of little economic value, and they are a potential hazard for further disease spread. Replanting of spots, where declining trees have been removed, with healthy scions on tristeza-tolerant rootstocks is recommended wherever possible.

The nurseryman and the grove owner can also take effective precautions with respect to multiplication of budwood. In the past a common method for rapid multiplication of budwood was topworking it into old trees. Such a procedure is a sure way of introducing into the budwood any viruses that may be present in the stock tree. The subsequent use of buds from such sources can result in a grand-scale distribution of the viruses that are the causal agents of disease. The safest procedure for establishing a source of budwood is to bud it into young seedling stocks which have never had a bud inserted in them.

Topworking of old groves for the purpose of changing varieties similarly offers an opportunity for virus infections from the old stock to spread into the new variety. The subject is mentioned because of the current interest in topworking grapefruit and other old citrus trees to lemon and Persian limes. From a virus-disease standpoint topworking is a hazardous practice especially when the trees selected for topworking are obviously diseased or are in a poor state of growth suggestive of the presence of disease.

The outstanding exception is the tristeza-infected trees topworked with acid lemons. In Brazil it was found that topworking sweet orange on sour rootstock with acid lemon such as Eureka and Lisbon could be successful even when the trees were showing definite tristeza symptoms. Similar experience in California (2) showed that topworking of quick-decline-infected Valencia orange on sour orange rootstock was successful when the topworking to lemon was complete but that partial topworking to lemon was not satisfactory. The presence of the diseased sweet orange top on a part of the tree greatly inhabited the growth of the lemon scions on the other part.

How this procedure of topworking of old field trees to acid lemon varieties will work under Florida conditions remains to be demonstrated. The strain of the tristeza virus is mild and there are indications that many of the visibly diseased field trees are carrying more than just the tristeza virus.

The vein clearing reactions of the Persian lime in association with the mild strain of the tristeza virus in Florida have been mentioned. Infected trees of Persian lime on sour orange rootstocks observed under field conditions may not have been quite as vigorous as the surrounding trees in some instances. At the same time these infected trees were not in a serious state of decline. The exact

Avocados And Limes --- Fall 1953

LUTHER L. CHANDLER
(AS TOLD TO HERB MOSHER)

I will treat the two commodities generally in a seperate manner. The lime industry in Florida has generally moved into its own in 1953. The summer was long and hot in the north and based upon the application of the juice content requirement as fixed by law, a better average lime as to size grade and juice content has been shipped to the northern market in fresh form and the consumer has responded very nicely. In addition to this, the canned or processed lime juice or limeade has been well received by the market, wider distribution has taken place and in these days of agriculture in general being unhappy, we find the lime people as a rule quite happy because more limes have been produced and sold in 1953 than ever before and at a better price than ever before.

The juicing and processing of limes has proven valuable to the lime industry. There is a general feeling of strong optimism as to the future of the lime industry. With the price and the demand as it is, there is going to be considerable effort to plant limes further up the state and quite a number of citrus grove owners in the middle part of the state are planning to top work some of their trees to limes. A word of caution should be said to these people because proper locations as well as facilities to fight off cold must be had since the lime will not stand the cold that a regular orange or grapefruit will stand. Then again the lime that is grown up the state will not mature as to juice content as early as will the limes in Dade County where the weather is consistently warmer throughout the winter and spring months. Also the person desiring to plant limes or engage in that business should not over-look the future competition of limes from Mexico and the West Indies.

Quoting from the Foreign Agriculture Report No. 70, January 1953, Office of the Foreign Agricultural Relations, U. S. Department of Agriculture, Washington, D. C., Page 7 shows that in Mexico limes are grown and produced in a total of thirty-one states or areas. In 1949, 1,792,450 boxes of limes were produced. This figure is arrived at by converting metric tons to boxes of 80 pounds each. The acreage to produce this volume had increased from 12,555 acres in 1939 to 25,315 acres in 1949. These figures will naturally show some increase since 1949. The canning of limes has begun in Mexico and the shipment of fresh fruit is increasing. I do not believe this affords a threat so serious to Florida lime growers as to exclude the growers in Florida from making a profit, yet it should be considered by the man who is a new planter of limes. The Persian type lime is the principal one grown in Florida. It is sold in its fresh form when green in color. The Mexican lime is the smaller type lime and generally has seeds in the fruit and does not mature at the same season as the Persian lime in Florida. The lime juice extracted from the Florida Persian lime seems more desirable than the lime juice extracted from the Mexican lime.

I do not have the exact figures on the West Indian limes because they are not available. There is estimated to be about 500,000 to 600,000 boxes per year now and of course this could be increased.

Many of the limes produced in Mexico and Cuba are produced in a half-commercial fashion with little or no cultivation, generally no spraying and they are widely scattered, and of course a great quantity of this fruit is absorbed and used in the territory where it is produced. At the present time Mexico is producing three times as many limes as produced in the state of Florida and the Florida production is about equal to that of the West Indies. We will not get all of the production from Mexico and the West Indies, but it is a strong factor to be considered.

I have no special fear for the lime grower in Florida who selects the right land, procures the right root stock and gives to his grove that extreme care and never ending attention that a lime tree requires. There is a saying in the lime industry that of the citrus family, the lime is the prima donna as far as those factors concerning its production, handling, shipping etc. It is a business that a man must know something about or he will wind up unhappy. However, I repeat that the average lime grower in Florida in 1953 came to the end of the season generally very happy and satisfied. There is now being planned an increase in acreage in 1954.

Avocados have held a more even keel during 1953. Much can be said for those growers who know what they are doing and who carry on a cultural and productive program that this prima donna of the fruit world also requires. Some of the varieties produced have proven out well. Others for which there was hope years ago have proven to be intermittent bearers. The average crop produced in Florida will show an increase in 1953 against the 1952 production. Many of the younger groves planted in recent years and of the better known varieties as to production, quantity of fruit produced, etc., have come into bearing in 1953. With this increase in production, price increase has not occurred as to avocados as is did on limes. Limes and avocados are quite companions as to type of soil, cultural practices, and also as to shippins season, depending of course on the particular variety of avocado in question. The more careful and better informed growers usually have more than one variety of avocado maturing at different times during the season and thus spread the risk.

Shipments from Cuba ended October 1st, as under the Trade Agreement and the special agreement between the Cuban Government and the United States Government, avocados can only be shipped from Cuba into the United States during the months of June, July, August and September. The details of the shipments from Cuba in 1953 are not yet known, but it is well known that the shipments were greater than ever before. Consumption of avocados throughout the United States is

showing some healthy increase but it must do so in order to absorb the entire output of California, Florida and Cuba. The market has not been spectacular in 1953 but has been fairly steady and in my opinion does not leave the average grower as happy as the lime grower, but all things considered it has not been too bad. The planting of new avocado groves in Florida has slowed down and the general attention is now being given to limes.

There is no question but that in 1953 as in previous years, many avocados were shipped from Florida from a slight to heavy immature condition. This was made partly possible because of heavy rainfall all summer and the fruit of each variety generally matured earlier in 1953 than in previous years. We had several threatening hurricanes throughout the hurricane season. Fortunately none of them hit in the Dade County area of Florida. The fear and threat of those hurricanes, however, caused growers to ship earlier than is quite proper in the opinion of most of us. Then when one grower began shipping, immediately the others do also and in a few days all are shipping on a variety that should have waited longer. A strong move is now being made to try and get the growers to adopt a Marketing Agreement. A Marketing Agreement will automatically require inspection based upon an adopted standard of size and grade. By having the control, naturally operating under a Marketing Agreement minimum sizes would be set as to each variety of avocado and this based on when an avocado is actually fully matured for good shipment, it is hoped that in this manner an improved standard of size, grade and maturity can be accomplished. Involved in this same consideration is the question of adopting standards for packages. That will be difficult to set up and enforce and I doubt a Marketing Agreement being effective in this respect. The thinking avocado growers know that something should be done and I believe they generally hope that a Marketing Agreement can be adopted based primarily upon application of inspection, in turn, based upon size and grade regulations, and size and grade to include as near as can be adopted and enforced from a practical standpoint a maturity standard. The lime growers having taken steps to impose upon themselves by law a maturity standard of juice content, certainly leaves it up to the avocado growers to now follow suit and find a practical way of improving their situation. Long and earnest study has been had on oil content requirement of avocados. The great number of varieties, however, showing a great range of oil content when the different varieties are matured, does not seem to afford any practical and effectual method of controlling maturity on this basis.

All in all, the future of avocados and limes appears very good.

DEGREENING CONDITIONS FOR FLORIDA CITRUS

(Continued From Page 11)

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affect of tristeza virus on the acid Persian lime and of other possible virus combinations that may be encountered in any topworking operations have yet to be determined.

It is not exactly expected that this warning as to the virus hazards will stop the practice of topworking citrus, but when the grower does decide to topwork he should take every possible precaution to insure that his source of budwood is healthy and that the trees he topworks are as healthy as possible.

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Golf Pro: "Tee the ball."
Student: "Sure, I see it, but why the baby talk?"

WHERE DO WE GO FROM HERE*

(Continued from page 8)

June, but rust mites had been common throughout most of the summer and fall. Although there was practically no greasy spot at the bottom of the tree, the tops had a fair amount. This certainly suggests here that the differential should not be attributed to spray coverage.

As I have outlined above, we are faced with certain incontrovertible facts.

1. Citrus can probably be raised without sprays or dusts and it will be a satisfactory product for cannery use.

2. Almost all insecticides, fungicides, and nutritional sprays adversely affect insect and mite control. Of these, sulfur is the major offender in actual practice.

3. Many growers are obtaining good results in the field with minimal amounts of sulfur and often with relatively poor coverage.

4. In spite of an effort to do a good job by some growers in the ridge area, greasy spot is a very real problem to them. It is so real that it sometimes appears that excessive spray is more a factor than adequate coverage.

There is a spector which haunts my dreams. It is that some day we will be spraying here as they do in California. They have excellent spray machines, use insecticides early and often, and have more bug troubles than ever before. Is it possible that we may be going in the same direction? Certainly, I believe in progress, but progress for citrus is measured by more boxes or better quality fruit. If this can be accomplished by decreasing the use of some spray materials, that is real progress.

I once preached long and loud that thorough and heavy applications of sulfur were most desirable. I am now sitting down to a repast of untasty crow and suggesting that this was wrong. I believed that the problem of adequacy should be thoroughly explored and I suggest that we may well find that a little sulfur goes a long way, and that it need not be applied as carefully as we have previously believed.

If this theory proves sound, we are on the threshold of some interesting possibilities. I have long advocated a close tie-in between chemical control measures and applied ecology and biological control. By expanding studies in these fields it may be possible to curtail other spray costs. Similarly, cooperation between the pathologist, horticulturist, and entomologist can lead in the same direction.

The ideas which I present today have been formulating over the last several years. I sincerely believe we should re-examine and re-appraise our present situation. Not more and more spraying, but more intelligent spraying will be an answer to our problems. We have the insecticides and the spray equipment. We need to know for sure how much material to use per tree; how often it should be applied; and how well it should dispersed over the trees.

There will still be large quantities of insecticides to sell, but a more judicious application will benefit the grower and, in turn, his spray material supplier. What is good for the grower is good for all of us!

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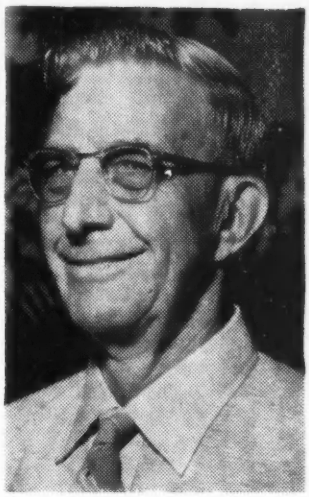
Notes Of The Trade



WINS "GULF" AWARD

Mr. F. M. Hahs, Route 1, Box 114, Lutz, Florida, has been awarded $500 by the Gulf Fertilizer Company as its longest steady customer. He is the winner of a contest held in conjunction with Gulf's 50th Anniversary Year, to find the person who has used its products for the longest consecutive number of years. Mr. Hahs ordered his first Gulf fertilizer on March 4, 1915.

"I sure am happy to win the award," he said, "but I'm even more pleased I started using Gulf Fertilizers in 1915. They have helped me get best income from my grove."

The Lutz man has a 40-acre block of trees, started originally from rough lemon seeds. They were budded in 1919 and set in the grove in 1923. By 1929 they were sustaining citrus trees.

During the 38 years the grove has developed, Mr. Hahs has used Gulf Brands fertilizers exclusively.

The Gulf Fertilizer Company, founded in 1903 by the late Lemuel R. Woods, has become one of the best known throughout the state.

In planning its 50th Anniversary Year celebration, Gulf honored employees in a service pin presentation ceremony. To honor its loyal customers, the company sponsored the contest featuring the commemorative

(Continued on page 22)

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER COMPANY

Reports Of Our Field Men . . .

NORTH HILLSBOROUGH AND PINELLAS COUNTIES
J. A. Hoffman

Growers have been busy applying their Fall application of fertilizer for the past several weeks and should finish this application by the middle of December. Already growers are planning on a Spring Top Dresser to produce more and finer quality fruit.

Purple mite are becoming quite active in this area and a Sulphur DN spray should be applied for control.

Moisture conditions have been good so far due to the light showers during the past month.

At this time I would like to wish everyone a Very Merry Christmas and a Happy New Year. May it be a prosperous one for all.

SOUTHWEST FLORIDA
Eaves Allison

Tomato crops over the Ruskin-Palmetto area have taken great strides since the disastrous rains of early Fall. Plants now are in heavy, healthy growth with large crops of late fruit setting at this writing, Nov. 16th, as well as good yields in sight of fruit well along to maturity.

This same thing holds true of all other beat-up vegetable crops that weathered the storms. Newly set out fields of cauliflower, cabbage, celery and glads are also growing off vigorously — looking like they are trying to make up for lost time. In the absence of any early killing cold the old exchequer may yet come back to life!

Citrus is looking good, and the cool days and nights of the past couple of weeks have brought a break in color in many areas. Most growers have applied their Fall fertilizer extra early this year — to offset the heavy leaching which probably took place during the unseasonal rains. Even that good Lyons Fertilizers can't stand thirty inches of rain!

SOUTH POLK, HIGHLANDS, HARDEE AND DESOTO COUNTIES
C. R. Wingfield

November has been a busy month for growers of both citrus and vegetables. Both were far behind with necessary work caused by the long period of rain and floods. The citrus grower has been busy applying his Fall application of fertilizer and cultivating. In some of the low flatwood sections it was necessary to be very careful with any deep cultivation for about all the roots active was close to the surface. In these cases light discing was done to aerate the soil before other cultivating. Dolomite has been used extensively due to the low calcium and magnesium in the soils after the rains.

There are indications that the purple mite has begun his work and a careful watch should be made and where they appear a control should be applied.

Fruit and vegetables are moving into the market channels in quantities. Some reports that pineapple oranges have reached maturity and will be picked before this publication. There appears to be a heavy droppage of pineapples for the past few weeks.

NORTH CENTRAL FLORIDA
V. E. Bourland

Weather is nice and beautiful. Everybody seems to be busy. Growers are getting groves fertilized and cover crops worked down. Some dusting and spraying being done. Most all young trees have been banked with soil to keep the cold off. Fruit is coloring up very good, and the pickers are tickled to work all day. All packing houses have moved some fruit. Canning plants are all set to get running this week which pleases everybody.

Truck farmers are all very busy too. Their crops are looking good, and if the cold stays off long enough looks as if they will have a good year.

WEST CENTRAL FLORIDA
J. E. Mickler

This past month has been a busy month for those involved in citrus. Fertilizer applications have been started, fruit is moving in many of the groves, and a good month of weather has helped the overall picture. It is pleasant to see the trend towards more careful fertilizer programs, and the results this year from the groves that have been on a Lyonizing program have been most heartening. Extra volume and healthy trees more than satisfy the customer, and better years are ahead.

Insect activity has been slow this past month, but a watchful eye for red spider should be kept. Rust mite control still continues in some groves as that pest has been most active this past season.

HIGHLANDS AND POLK COUNTIES
J. T. Griffiths and J. K. Enzor, Jr.

Growers have been applying their Fall citrus fertilizer during November. Growing conditions have continued to be most satisfactory. Some rain has fallen and soil moisture continues to be good. Fruit drop which was being experienced in October has ceased, except on grapefruit where considerable drop is going on.

Dust mites are not a particular problem, although sprays have been necessary in some groves. Heavy purple mite concentrations have been found in several groves and there has been some mesophyll collapse following windy days in the middle of the month.

Greasy spot is causing leaf drop in some groves. It now appears that greasy spot will probably not be as prevalent in the Ridge section as it has been in the past two years. At the present time it is particularly severe on the pink grapefruit.

PASCO AND HILLSBOROUGH COUNTIES
E. A. McCartney

Fruit is moving at almost mid-season volume about three weeks ahead of normal season. The Fall fertilizer application is well along although this was held up on account of the heavy rains. Vegetable growers are planting seed beds getting ready for early Spring planting.

The Webster section was not as badly hurt as the excessive rains indicated. A few beans and cukes were damaged. The rains came mostly in the off season. This section is planting more lettuce than ever before. It is growing more popular each year. A precooling plant is needed if it ever becomes a big deal.

ADVERTISEMENT — LYONS FERTILIZER COMPANY

Uncle Bill Says;

Florida Winters are sumpin' folks in most other states are inclined to envy 'n judgin' from the little experience we've had with snow and ice and long-handled underwear we shore don't blame 'em . . . but even so every now and then we git a little breeze in the winter months that has sort of a sharp edge to it . . . and on rare occasions the old thermometer fergits where it is and even down here in sunny Florida we've been known to have some pretty chilly days.

And fer us citrus growers and us vegetable growers this sort of thing ain't at all pleasin' . . . and bein' as vegetables are as tender as they are there ain't too much we kin do about it when it gits a little too cool . . . but us citrus growers has learned over a considerable period of years that if we keep our trees strong and healthy it's mighty seldom that any permanent damage is done to 'em.

Which is why, along with the majority of Florida's citrus growers we keep a close eye on the condition of our trees, knowin' that if they are in good condition they'll not only grow us more and better fruit but they'll go through the sort of freezes we usually have in Florida in good shape.

And like feedin' a baby the best answer is to see that our trees git the best diet possible . . . often a diet designed 'specially for our particular grove . . . you can't any more starve a grove or fail to give it the sort of plant food it needs than you kin a growin' child, so if it ain't out of order we'd like to suggest that you let one of these here Lyons Field Service fellers check up on your fertilizer needs with you 'n if you have the same sort of experience we have had with 'em you'll find they can be mighty helpful.

NOTES OF THE TRADE

(Continued from page 19)

$500 award to the customer who had used Gulf Brands exclusively for the longest consecutive number of years.

Mr. Lem P. Woods, Chairman of the Board, said, "Our success in serving Florida agriculture during the past 50 years has been due to the loyal service of Gulf employees and the cooperation of our many fine customers. Mr. Hahs exemplifies this spirit of customer cooperation."

Classified Ads

SUPERIOR CITRUS TREES — Now available on Rough Lemon, Sour Orange, Sweet Orange, and Cleo Rootstocks. Prices $1.10 up, depending on the size and number ordered. Also Seedlings for lining out of all varieties. Write for "Tips To Growers."
WARD'S NURSERY
Avon Park, Fla.

PENSACOLA BAHIA SEED — Purity 96.96 percent, germination 92 percent, $20.00 CWT. Paraguyan Bahia Seed, purity 98.18 percent, germination 91 percent, $50.00 CWT. Florida Black Rye, purity 99.84 percent, germination 91 percent, $4.00 bushel.
LEWIS & VICKERS SEED CO.
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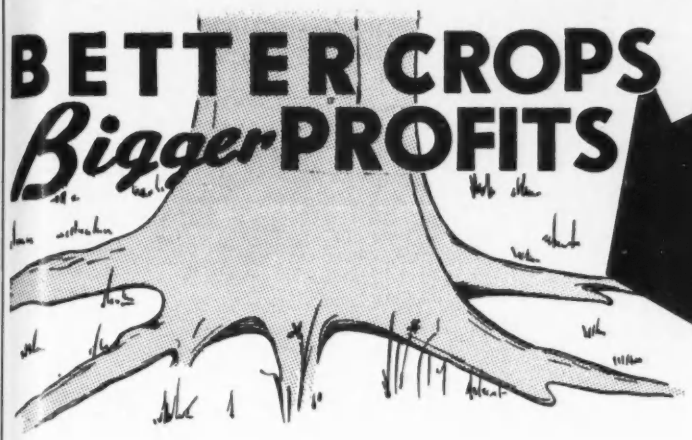
BETTER CROPS *Bigger* PROFITS BEGIN HERE!



The Proof Lies Here...

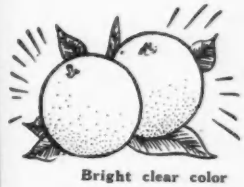
You build your profits in your soil. Naco Fertilizer increases your profits by feeding your grove a properly balanced diet plus necessary mineral supplements.

NACO Fertilizer is prepared with minute attention to detail in completely modern factories. When all the necessary minerals and nutrients have been selected, weighed and measured, they are blended thoroughly—to assure maximum uniformity.

Specify Naco Fertilizer for your grove. Then, look for better bloom—you'll find it! For fruit better in every way —you'll find it! Look for more profit on every box—you'll find that too. Begin at the root of your problem —with Naco!

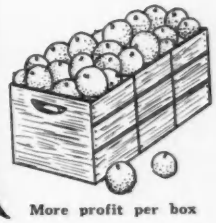
NACO is ready to serve you.

Healthy Abundant Bloom



Bright clear color

Firm, juicy, flavorful fruit



More profit per box

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FLORIDA

Healthy Trees Produce The Most . . . And The Best

And in the case of trees a sound, nourishing plant food diet, in conjunction with sound cultural practices, serves to keep citrus trees in tip-top shape so that they are able to withstand the ravages of varied pests and inclement weather much more successfully than is the case of trees which are sickly due to improper nourishment.

Florida's growers are well aware of this fact and a vast number of them continue, year after year, to provide their trees with the proper plant foods through the use of Lyons Fertilizers.

Some of our best customers have made enviable production records through the constant use of Lyons Fertilizers throughout the years, incidentally they have found that on the sound basis of fertilizer costs per box of fruit their fertilizer charges are extremely reasonable . . . which is why so many Florida Growers agree that

LYONS FERTILIZERS
Produce
Maximum Crops
Of Highest Quality

Let our trained staff of field service men consult with you if you have problems pertaining to the production of the finest crops

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